

or striae at the sides, but the posterior middle has finer concentric ones, in half-circles with the concavity caudad. *H. tripartitus*, Ckll., shows the same sort of thing, but not so distinctly. It is nearly certain that *meliloti* and *tripartitus* are races of one species.

University of Colorado,
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XLI. — *Descriptions of new Batrachians discovered by Mr. G. L. Bates in South Cameroon.* By G. A. BOULENGER, F.R.S.

Rana goliath.

Vomerine teeth in two very strong oblique series, narrowly separated in the middle, their outer extremities touching the choanæ. Head much depressed, a little broader than long; snout obtusely pointed, as long as the orbit; canthus rostralis very obtuse; loreal region deeply grooved; nostril a little nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum small, hidden. Fingers rather short, obtuse, bordered by a very distinct dermal fold, first and second equal, fourth but slightly shorter than third; one large, oval, flat, subarticular tubercle under each finger. Toes moderate, the tips dilated into small but very distinct disks, which are embraced by the very broad full web; subarticular tubercles large, oval, flat; a flat, elliptical inner metatarsal tubercle, measuring $\frac{2}{3}$ its distance from the end of the inner toe; no outer tubercle; a strong dermal fringe on the outer side of the fifth toe. The tibio-tarsal articulation reaches the tip of the snout; tibia as long as the foot, a little more than half length of head and body. Skin finely shagreened above, with small warts, especially on the sides; upper surface of thigh and tibia with narrow longitudinal glandular folds; throat and belly with small granules; a strong curved fold from the eye to the shoulder. Dark olive-brown above, with small darker spots on the body and irregular cross-bars on the limbs; hinder side of thighs blackish, dotted with white; yellowish white beneath.

This remarkable frog is described from a single specimen, from Efulen, measuring 250 mm. from snout to vent. A still larger specimen was caught along the Kribi River,

between Efulen and the coast, in a pool which some women were fishing out with scoop-nets. It was kept alive in a large spirit-drum half filled with water; but it unfortunately escaped.

R. goliath, the largest frog known, exceeding in size even *R. Guppyi*, is most nearly related to the West-African *R. crassipes*, Peters.

Arthroleptis Batesii.

Tongue with a conical median papilla. Head moderate, as long as broad; snout obtusely pointed, as long as the eye, with distinct canthus and nearly vertical, concave, loreal region; nostril a little nearer the tip of the snout than the eye; interorbital region as broad as or a little broader than the upper eyelid; tympanum rather indistinct, about half the diameter of the eye. Fingers rather short, first and second equal; toes with a short but very distinct basal web, extending as a fringe on each side; tips of fingers and toes dilated into well-developed disks; subarticular tubercles strong; two small metatarsal tubercles, inner oval, outer round; a small tubercle on the tarsus, its distance from the inner metatarsal tubercle less than that between the two metatarsal tubercles. Tibio-tarsal articulation reaching between the eye and the tip of the snout. Skin smooth, upper eyelids and flanks with small warts; two curved glandular folds on the back, behind the eyes, converging on the scapular region; a strong fold from the eye to the shoulder. Brown above, sometimes tinged with crimson, the outer edge of the dorsal glandular folds sometimes blackish; a light cross-bar between the eyes; an oblique dark brown band, edged with whitish behind, from the eye over the temple to the front of the arm, where it terminates in a point; loreal region sometimes bright crimson; limbs with oblique dark cross-bands; a triangular dark brown patch on the anal region; lower parts yellow, uniform or with small brown blotches on the breast and on the sides of the belly; a series of brown spots bordering the lower lip.

From snout to vent 31 mm.

Two specimens from Efulen and four from Zima.

Apart from the very slightly webbed toes and the united outer metatarsals, this very distinct species bears a striking resemblance to *Phrynobatrachus plicatus*, Gthr., which inhabits the same district.

Arthroleptis cornutus.

Tongue with a conical median papilla. Head moderate, as long as broad; snout rounded, not quite as long as the eye, with obtuse canthus and concave loreal region; nostril a little nearer the tip of the snout than the eye; interorbital space narrower than the upper eyelid; tympanum hidden. Fingers rather short, first and second equal; toes with a short but very distinct basal web; tips of fingers and toes dilated into small disks; subarticular tubercles small but very prominent; two small but very prominent metatarsal tubercles, inner oval, outer round; a small rounded tubercle on the inner side of the tarsus, connected with the inner metatarsal tubercle by a narrow dermal ridge; the distance between the two metatarsal tubercles nearly equals the distance between the inner and the tarsal tubercle. The tibio-tarsal articulation reaches the eye. Skin of upper parts with prominent warts of unequal size; a conical or spine-like tubercle on the posterior part of the upper eyelid. Grey above, with darker spots, and more or less distinct cross-bars on the limbs; a light vertebral stripe may be present; hinder side of thighs with a more or less distinct whitish dark-edged stripe; lips and lower parts white, with large roundish black spots.

From snout to vent 20 mm.

Two specimens from Zima.

Closely allied to *A. calcaratus*, Peters; distinguished by the stouter form and shorter hind limbs and by the lesser distance between the inner metatarsal tubercle and the tarsal.

Arthroleptis tenuatus.

Tongue with a conical median papilla. Head moderate, as long as broad; snout rounded, as long as the eye, with distinct canthus and nearly vertical loreal region; nostril equally distant from the eye and from the end of the snout; interorbital space broader than the upper eyelid; tympanum very distinct, two fifths the diameter of the eye. Fingers very unequal in length, first and fourth much shorter than second, which is barely half the length of third (*male*), the tips dilated into small but very distinct disks; toes slender, nearly free, with a very slight rudiment of web, the tips dilated into rather large disks; subarticular tubercles small and moderately prominent; a small, oval, inner metatarsal tubercle, measuring about half the length of the inner toe. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Skin smooth. Olive-brown above, with a

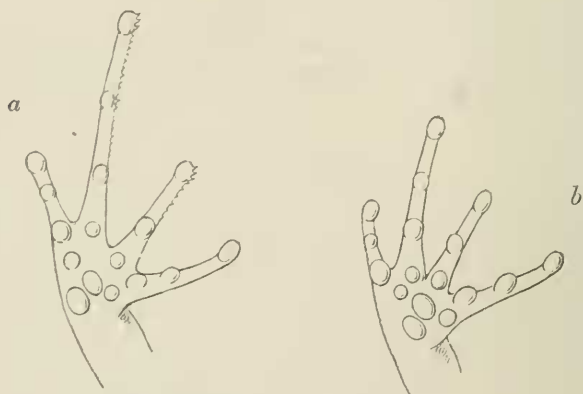
greyish-white, dark-edged streak on each side of the back, beginning behind the upper eyelid and converging towards its fellow on the scapular region; a greyish streak round the snout, above the canthi, and a broader band of the same colour, forming a very open chevron, across the interorbital region; limbs with ill-defined dark cross-bars; sides of head, body, and limbs with white dots; lower parts white, throat brown. Male with a subgular vocal sac.

From snout to vent 21 mm.

A single specimen from Zima.

The extraordinary elongation of the third finger I have ascertained to be a character of the males in the species of *Cardioglossa*, Blgr., and in *Arthroleptis variabilis*, Matsch., and *A. pæcilonotus*, Peters, with which I now regard *A. macrodactylus*, Blgr.*, *A. bivittatus*, F. Müll. (both males), and *A. inguinalis*, Blgr. (female), as specifically identical. For the same reason I now hold *A. Seimundi*, Blgr., to be the male of *A. variabilis*. In well-preserved specimens, the inner side of the second and third fingers of these males may be seen to be furnished with a fine serrature of tooth-like, translucent granules, differing from any of the nuptial excrescences with which I am acquainted in Batrachians.

Fig. 1.



Hand of *Arthroleptis pæcilonotus*. a, ♂; b, ♀.

The species described under the name of *Arthroleptis* are much in want of revision. I may here note that *A. sechellensis*, Boettger, differs in the entire, elliptical tongue, and

* The figure of the type (Cat. Batr. Ecaud. pl. xi. fig. 5) is taken from a badly preserved specimen, and very inaccurate as regards the shape of the snout.

deserves to be made the type of a distinct genus, for which I propose the name of *SOOGLOSSUS*; that I overlooked the absence of teeth in *A. Boettgeri*, Blgr., and *A. leucomystax*, Blgr., which must be referred to *Cacosternum*, Blgr., and *Cardioglossa*, Blgr., respectively; and that, to my great surprise, the specimens of *A. africanus* (*Heteroglossa africana*, Hallow., *A. gabonensis*, Mocq., *A. verrucosus*, Werner) collected by Mr. Bates have shown the males to be provided with a powerful dentition in the lower jaw. This fact, together with the presence of a deep groove between the outer metatarsals, which in the typical *Arthroleptis* are completely bound together, justifies the establishment of a new genus, *DIMORPHOGNATHUS*, for *Heteroglossa africana*, the generic name proposed by Hallowell being preoccupied.

Fig. 2.



Upper and lower jaws and pectoral girdle of *Dimorphognathus africana*, ♂.

The mandibular dentition of *Dimorphognathus africana* consists of a very large fang in front, followed by ten or eleven smaller sharp acrodont teeth, of unequal size. This discovery further emphasizes the artificial nature of the dentition as a family character in the Tailless Batrachians*. The fact that the extraordinarily lengthened and serrated third finger of the male occurs both in *Arthroleptis* and *Cardioglossa* shows these two genera to be closely allied. *Cardioglossa* is simply a toothless *Arthroleptis*, just as *Dendrobates* may be described as a toothless *Phyllobates*.

I may add that the maxillary teeth of *Dimorphognathus africana* are longer than in most frogs, and that the præcoracoids (clavicles) are remarkably slender; the bony style of the omosternum is forked at the base.

Cardioglossa elegans.

6. Allied to *C. leucomystax*, but fingers and toes more more distinctly dilated at the end, and inner these 'Annals,' (6) i. 1888, p. 188, and (7) xii.

metatarsal tubercle smaller, much shorter than the inner toe. Tibio-tarsal articulation reaching the eye or between the eye and the tip of the snout (the tympanum or the eye in *C. leucomystax*). Greyish brown above, with large and small symmetrical dark brown spots with a fine pale outline; the first large spot begins between the eyes and is triangular with the base turned forwards; it is immediately followed by a second and by a third, each subtriangular or cordiform with the point turned forwards; a large oval spot on the lumbar region; a whitish line round the eye and the temporal region; limbs with spots and bars edged with lighter, as on the body; throat and belly brown, or much spotted with brown.

From snout to vent 37 mm.

Four specimens from Efulen.

Rappia pleurotenia.

Nearly allied to *Rappia argus*, Peters, with a variety of which it agrees very closely in the coloration. Likewise with the tympanum hidden, the tibio-tarsal articulation reaching the eye, and no fold across the throat, but distinguished by the very short, quite rudimentary web between the fingers. Dark purplish brown above, with scattered white dots; a white, black-edged streak on each side of the head and body, meeting its fellow on the tip of the snout, bordering the upper eyelid, widening on the side of the body, and terminating more or less abruptly in advance of the groin; a few small black spots on the lateral streak; upper surface of thighs brown; lower parts bright yellow.

From snout to vent 31 mm.

A single specimen from Zima; another had been previously obtained by Mr. Bates on the Benito River.

Hylambates calcaratus.

Vomerine teeth in two small rounded groups between the choanæ. Head broader than long; snout rounded, nearly as long as the eye; canthus rostralis distinct; loreal region concave; interorbital space as broad as the upper eyelid; tympanum very distinct, about two thirds the diameter of the eye. Fingers rather short, much depressed, one-third to half webbed, the tips dilated into large disks; toes three-fourths webbed, the web reaching the disk of the fifth toe; subarticular tubercles strong; a strong, feebly compressed, oval inner metatarsal tubercle. Tibio-tarsal articulation reaching the

eye or between the eye and the tip of the snout; tibia about half the length of head and body. Skin shagreened above, granular beneath; a conical tubercle on the heel (tibio-tarsal articulation). Reddish brown, purplish brown, or olive above, uniform or with ill-defined darker or lighter markings; upper lip with more or less distinct dark bars; sides of head sometimes dark brown; sides of body and sides and lower surface of limbs dark brown; belly spotted or marbled with brown. Male with a subgular vocal sac.

From snout to vent 42 mm.

A single specimen from Efulen; also several from Cape St. John and the Rio Benito District (Spanish West Africa), which I had previously confounded with young *H. rufus*. This species stands very near *H. rufus*, Reichen., differing only in the rather less depressed head and in the presence of a conical tubercle on the heel.

Hylambates cubito-albus.

Vomerine teeth in two small groups on a level with the posterior border of the choanae. Head broader than long, strongly depressed; snout rounded, as long as the eye; inter-orbital space broader than the upper eyelid; tympanum very distinct, two thirds the diameter of the eye. Fingers rather short, with a mere rudiment of web; toes half webbed, three phalanges of fourth and two of fifth free; disks well developed; subarticular tubercles strong; inner metatarsal tubercle moderate, oval, feebly prominent. The tibio-tarsal articulation reaches the eye. Skin smooth above, granular beneath. Green above, with a fine black areolation; a white line bordering the upper lip, another above the anal region; elbow, knee, and heel with a large round white spot; sides of thighs purplish brown; lower parts white.

From snout to vent 33 mm.

Two specimens from Zima. The British Museum has since received from Dr. C. Christy two further specimens obtained by him in Unyoro, east of Lake Albert, along with examples of two other frogs common in Cameroon, *Rana albilabris*, Hallow., and *Phrynobatrachus plicatus*, Gthr.

In coloration this new species resembles very strikingly *H. notatus*, Peters, which is the young of *H. rufus*, Reichen., and which differs in a more slender form and a more developed web between the fingers and toes. It is more nearly allied to *H. Vannutellii*, Blgr., likewise obtained in Unyoro by Dr. Christy, but differs from it in the broader interorbital space.